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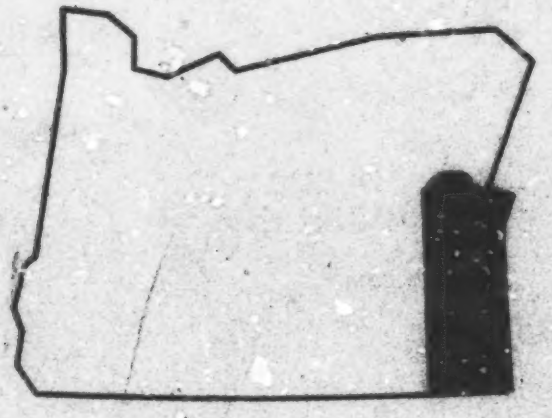
FEMA-209-410153

FLOOD INSURANCE STUDY

ORIGINAL

CITY OF VALE, OREGON
MALHEUR COUNTY



SEPTEMBER 4, 1987

Federal Emergency Management Agency

COMMUNITY NUMBER - 410153

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NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for flood plain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	2
2.0	AREA STUDIED	2
2.1	Scope of Study	2
2.2	Community Description	2
2.3	Principal Flood Problems	2
2.4	Flood Protection Measures	4
3.0	ENGINEERING METHODS	5
3.1	Hydrologic Analyses	5
3.2	Hydraulic Analyses	6
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	8
4.1	Flood Boundaries	8
4.2	Floodways	8
5.0	INSURANCE APPLICATION	9
6.0	FLOOD INSURANCE RATE MAP	12
7.0	OTHER STUDIES	12
8.0	LOCATION OF DATA	13
9.0	BIBLIOGRAPHY AND REFERENCES	13

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TABLE OF CONTENTS (Cont'd)

Page

FIGURES

Figure 1 - Vicinity Map..... 3
Figure 2 - Floodway Schematic..... 9

TABLES

Table 1 - Summary of Discharges..... 7
Table 2 - Floodway Data..... 10

EXHIBITS

Exhibit 1 - Flood Profiles

Malheur River	Panels 01P-03P
Bully Creek	Panel 04P

Exhibit 2 - Flood Insurance Rate Map

Exhibit 3 - Elevation Reference Marks

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1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study represents a revised investigation of the existence and severity of flood hazards in the City of Vale, Malheur County, Oregon, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used by the City of Vale to update existing flood plain regulations as part of the regular phase of the National Flood Insurance Program (NFIP). The information will also be used by local and regional planners to further promote sound land use and flood plain development.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data prepared by another organization originally for purposes of the NFIP. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the NFIP. However, if better information is known to exist or has been developed since the date of this study, the information should be immediately forwarded to the address below for consideration for revision of this study.

Natural and Technological Hazards Division, FEMA
Federal Regional Center
130 228th Street, SW.
Bothell, Washington 98021-9796

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by U.S. Army Corps of Engineers (COE), Walla Walla District, as reported in the Flood Insurance Study for the unincorporated areas of Malheur County, Oregon (Reference 1).

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1.3 Coordination

On August 14, 1985, Dames & Moore was instructed by FEMA to prepare a Flood Insurance Study for the City of Vale using the detailed-study data for the Malheur River, Bully Creek, and Willow Creek from the Flood Insurance Study for the unincorporated areas of Malheur County, Oregon (Reference 1).

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Vale, Malheur County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

Flooding from the Malheur River, Bully Creek, and Willow Creek affecting the City of Vale was studied by detailed methods.

The areas studied by detailed methods were selected based on the extent and validity of available hydrologic and hydraulic data.

2.2 Community Description

The City of Vale is located in northeastern Malheur County, in the southeastern corner of Oregon. The city is bordered on all sides by unincorporated areas of Malheur County.

The population of Vale in 1980 was 1,558 (Reference 2). The area of the city is approximately 1.0 square mile. The City of Vale is the county seat.

The principal industries in the area are agriculture, livestock, irrigation farming, and food processing. The flood plains along the Malheur River are wide and devoted mainly to agriculture. The soils in this region vary in depth with some rocky outcrops and their texture is predominantly of a fine silt of volcanic origin.

The City of Vale has a semiarid climate. Precipitation in the region varies from 0 to 20 inches. Average temperature varies from 24°F in February to 72°F in July.

2.3 Principal Flood Problems

A major source of flood damage in the City of Vale is the Malheur River. Bully and Willow Creeks, two tributaries of the Malheur River, have also caused past flooding damage in the area. Past flooding on the Malheur River is best summarized by a 1974 COE Flood Plain Information report for Ontario and vicinity (Reference 3):

> Damaging floods have been reported to have occurred on the Malheur River as early as 1904. Floods causing significant

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FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

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damage are described to have occurred in 1910, 1952, and 1957. Among these, the 1910 flood was the highest of record on the Malheur River.

Although a damaging flood occurred in 1952, a more severe flood with the same characteristics occurred in February 1957. This flood is described by the COE as follows:

> This flood on the Malheur River was caused by rain and snow-melt on frozen ground. The warm winds and rain hit Malheur River Basin 23 February and the streams in the basin began to rise about immediately because of frozen ground. Both the Malheur River and Bully Creek reached their maximum stage near Vale at about 4:00 a.m., 25 February. At the height of the flood most of the City of Vale and the surrounding residental area was inundated. Most of the main business district was flooded to a depth of from 2-3 feet. A few homes in the low area near the Malheur River were inundated to a depth of near 6 feet.
>
> In the Malheur Valley below Vale, the inundation of land, destruction of irrigation canals and headworks and washing out of bridge approaches were observed. Approximately 40 homes on the right bank near Ontario were inundated.
>
> Malheur River was one the most seriously affected streams. It drains an area of 4,610 square miles (and experiences rapid rises). Flood peaks of 20,800 cubic feet per second (cfs) and 24,000 cfs occurred in the Malheur River at Vale and Ontario, Oregon, on the 25th. These peaks approached the largest known floods in the area.

The flood peaks that are mentioned in the last paragraph were comparable to the 100-year flood.

The most recent flood in the Malheur River basin occurred in 1971. U.S. Geological Survey (USGS) records show a flow of 18,600 cfs on the Malheur River at Vale, and a flow of 5,070 cfs on Bully Creek at Warm Springs (Reference 4).

2.4 Flood Protection Measures

Under Public Law 516, flood protection is provided along 2 miles of the Malheur River at Vale and along the lower 1 mile of Bully Creek. This was accomplished by channel rectification, low levees, and riverbank protection to prevent flood damage to the City of Vale and highly developed agricultural areas. Protection extends along the left bank of Bully Creek and the Malheur River and along two reaches on the right bank of the Malheur River.

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These levees are capable of passing the Bully Creek and Malheur River 100-year floodflows with 3 feet of freeboard. The levees are constructed of compacted clayey silt with riprap placed in areas with a high erosion potential. The levees are maintained by the City of Vale and are inspected annually.

3.0 ENGINEERING METHODS

For the flooding sources studied by detailed methods in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied by detailed methods affecting the community.

Several gaging stations on streams in Malheur County and nearby drainages were used in the hydrologic analysis. The gaging stations and their periods of record are as follows:

Snake River at Weiser	1910 to 1979
Snake River at Nyssa	1974 to 1979
Malheur River at Riverside	1919 to 1979
Malheur River near Hope	1949 to 1979
West Fork Malheur River near Beulah	1936 to 1979
Bully Creek at Warm Springs	1963 to 1979
Bully Creek near Vale	1963 to 1979
Jordan Creek near Lone Tree Creek	1946 to 1971

These gaging stations are operated by the USGS and were the principal ones used for defining discharge-frequency relationships for the

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respective study reaches on the streams in the City of Vale. Values of the 10-, 50-, 100-, and 500-year peak discharges were obtained from a log-Pearson Type III distribution of annual peak flow data (Reference 5).

Peak discharge-drainage area relationships for the Malheur River, Bully Creek, and Willow Creek are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Water-surface elevations of floods of the selected recurrence intervals were computed through using the COE HEC-2 step-backwater computer program (Reference 6).

Cross sections for backwater analysis of the streams in the study area were obtained from aerial photographs or field surveys (Reference 7). All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for the channels of the detailed-study reaches ranged from 0.025 to 0.035. Flood plain roughness values ranged from 0.025 to 0.035 for all floods. The acceptability of all assumed hydraulic factors, cross sections, and hydraulic structure data was checked by computations that duplicated historical floodwater profiles where available.

Starting water-surface elevations for the detailed-study reaches were calculated using the normal-depth method.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the description of the marks are presented in Elevation Reference Marks (Exhibit 3).

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Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Malheur River Near Vale	3,880	6,400	12,300	17,300	58,000
Bully Creek Near Vale	570	1,000	3,000	5,000	24,700
Willow Creek Near Vale	725	4,750	8,300	9,900	14,500

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4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year flood plain boundaries and 100-year floodway to assist communities in developing flood plain management measures.

4.1 Flood Plain Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:24,000, with a contour interval of 20 feet (Reference 8).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zones AE and AH); and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

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The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the flood plain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated at selected cross sections (Table 2). In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

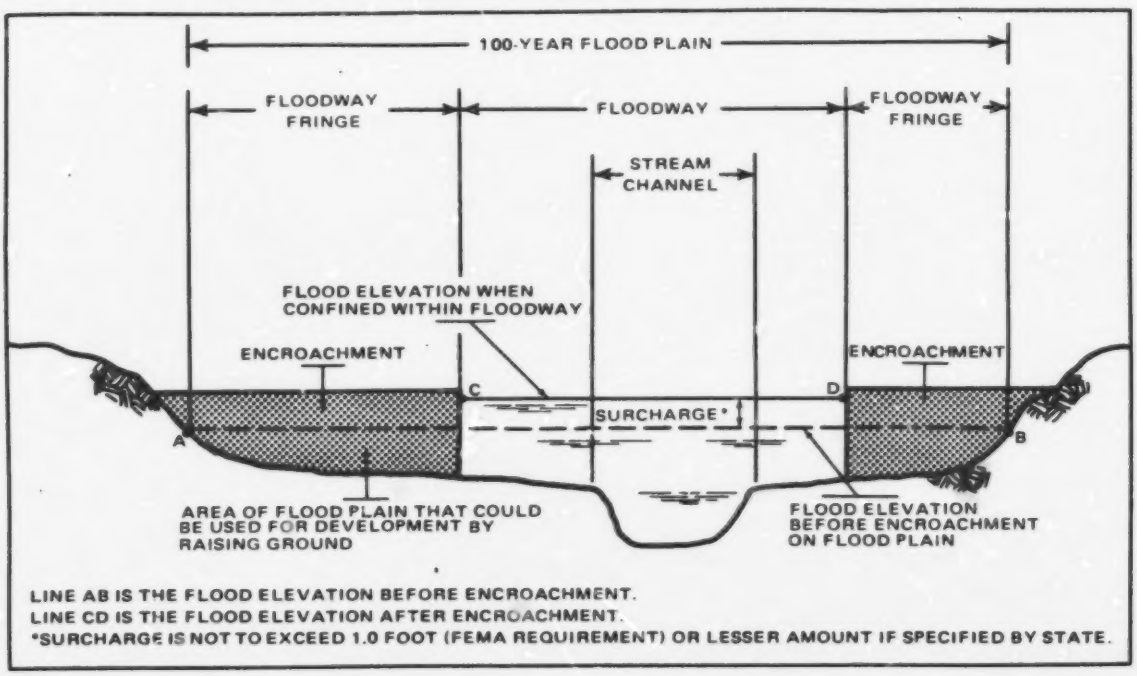
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Malheur River								
F	9,870	481/50[2]	3,248	5.3	2,228.5	2,228.5	2,229.2	0.7
G	12,265	596/280[2]	3,929	4.4	2,231.3	2,231.3	2,232.3	1.0
H	15,325	272/35[2]	2,398	7.2	2,235.8	2,235.8	2,236.0	0.2
I	15,555	371/65[2]	3,634	4.8	2,236.6	2,236.6	2,236.8	0.2
J	16,515	254[3]	2,386	7.3	2,237.1	2,237.1	2,237.2	0.1
K	17,100	299[3]	2,531	6.8	2,238.1	2,238.1	2,238.2	0.1
L	17,820	192/40[2]	2,016	8.6	2,240.0	2,240.0	2,240.1	0.1
M	18,260	353/150[2]	3,721	4.6	2,241.3	2,241.3	2,241.4	0.1
N	19,040	274/95[2]	2,926	5.9	2,241.6	2,241.6	2,241.7	0.1
O	19,270	245/60[2]	2,824	6.1	2,241.8	2,241.8	2,241.9	0.1
P	20,000	256[3]	2,955	5.9	2,242.3	2,242.3	2,242.3	0.0
Q	20,635	240[3]	2,905	6.0	2,242.6	2,242.6	2,242.6	0.0

[1]Feet Above a Point 12,265 Feet Downstream of Nevada Diversion Dam [2]Width/Width Within Corporate Limits
[3]Floodway Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

FLOODWAY DATA

MALHEUR RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Bully Creek								
A	2,050	113[2]	750	6.7	2,243.4	2,243.4	2,243.9	0.5
B	4,000	100[2]	655	7.6	2,245.7	2,245.7	2,245.9	0.2

[1]Feet Above Confluence With Malheur River [2]Floodway Lies Entirely Outside Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

FLOODWAY DATA

BULLY CREEK

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Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AH

Zone AH is the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually areas of ponding) where average depths are between 1 and 3 feet. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For flood plain management applications, the map shows by tints, screens, and symbols, the 100- and 500-year flood plains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

As data from the Flood Insurance Study for the unincorporated areas of Malheur County were used to prepare this study, the results of the study are in agreement (Reference 1).

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8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW., Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Flood Insurance Study, Malheur County, Oregon (Unincorporated Areas), September 27, 1986

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Oregon, December 1981

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4. U.S. Department of the Interior, Geological Survey, Water Resources Data for Oregon, 1961-1981

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6. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, November 1976

7. U.S. Department of the Army, Corps of Engineers, Walla Walla District, Aerial Photography, Scale 1:12,000, Bully Creek, Malheur River and Willow Creek (controlled, November 13, 1979)

8. U.S. Department of the Interior, Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24,000, Contour Interval 20 feet: Vale East, Oregon (1967); Vale West, Oregon (1967)

Chow, Ven Te, Open-Channel Hydraulics, New York: McGraw-Hill Book Company, 1959

U.S. Department of the Army, Corps of Engineers, Statistical Methods in Hydrology, Sacramento, California, January 1962

U.S. Department of the Interior, Geological Survey, Water-Supply Paper 1849, Roughness Characteristics of Natural Channels, H.H. Barnes, Jr., 1967

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Exhibit 3 - Elevation Reference Marks

REFERENCE MARK	FIRM PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM18	0001	2,239.61	Brass screw with washer, marked "VLE 20 1979", set along the centerline of U.S. Highway 20, approximately 1 mile east of Vale, near the western end of a turnout along the southern side of the highway, in the proximity of the section line between Sections 20 and 21, T18S, R45E. Established by U.S. COE.
RM19	0001	2,242.37	Oregon State Highway Department standard disk, stamped "2242.889 E 37 1930," located at the eastern edge of the City of Vale, on U.S. Highway 20 at the western end of the steel span over Malheur River, at the extreme southern (upstream) end of the pier and under the board sidewalk. Established by COE.
RM20	0001	2,245.68	Brass screw with washer, marked "VLE 18 1979", set in a paved approach, located at the southeastern corner of the Lytle Boulevard bridge over the Malheur River, south of Vale. Established by COE.
RM21	0001	2,240.79	U.S. Coast and Geodetic Survey standard disk, stamped "2241.311 D 37 1930," located at the Union Pacific Railroad crossing John Day Highway (12th Street, U.S. Highway 26), 84 feet west of the centerline of the highway, 71.5 feet south of the main track, at the wooden water tank just north of the station, and in the northern concrete footing.

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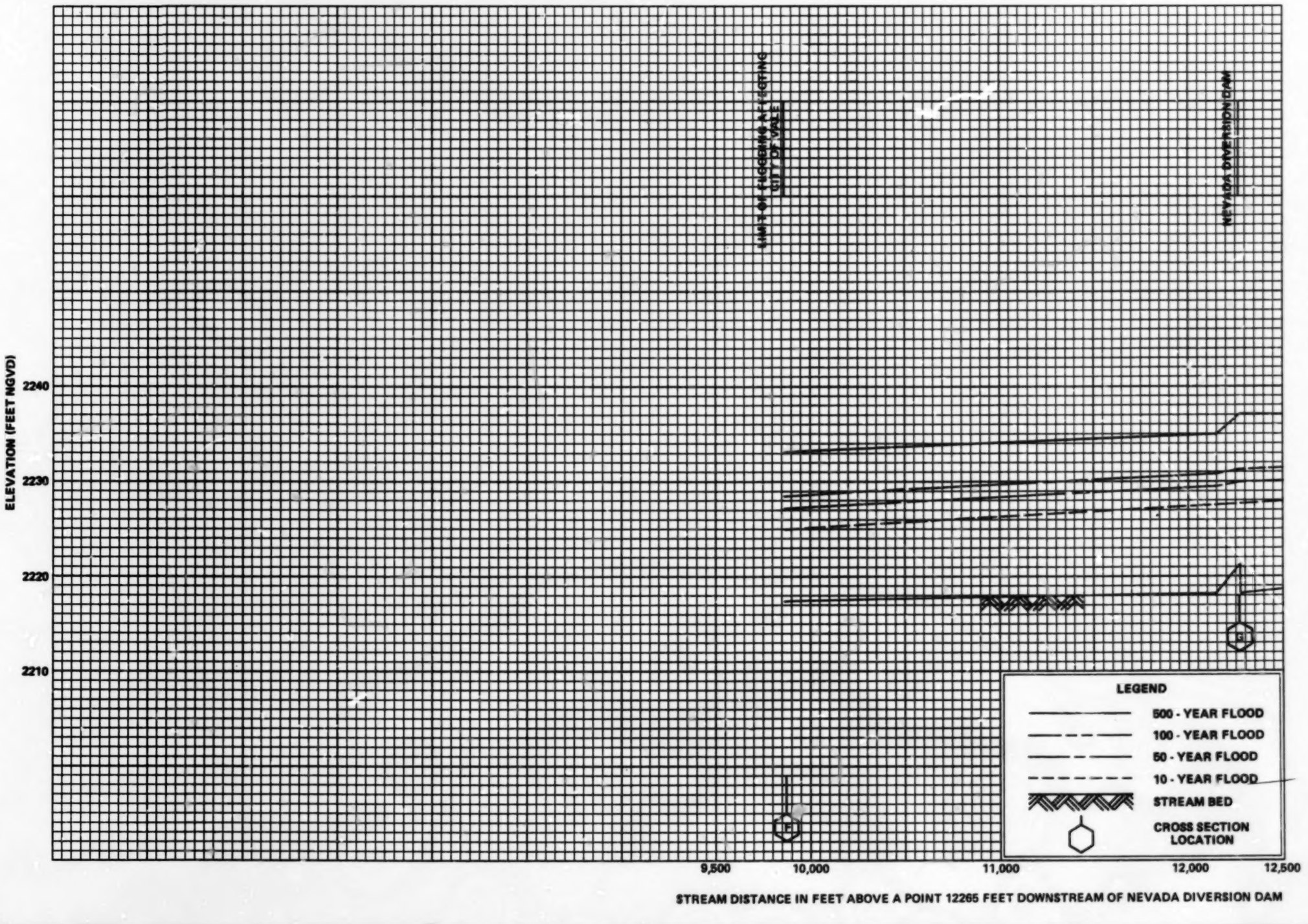

FLOOD PROFILES

MALHEUR RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

01P

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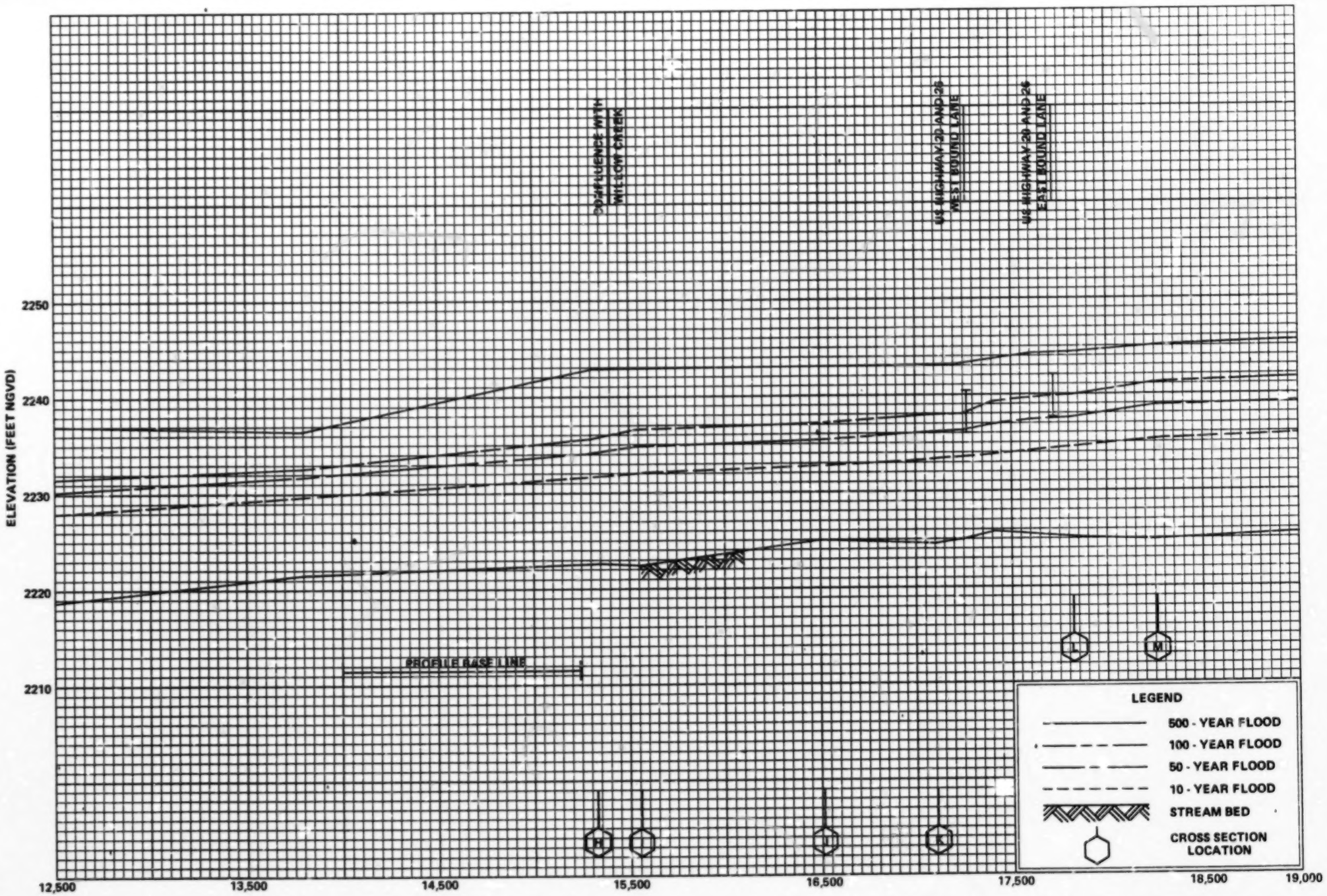

FLOOD PROFILES

MALHEUR RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

02P

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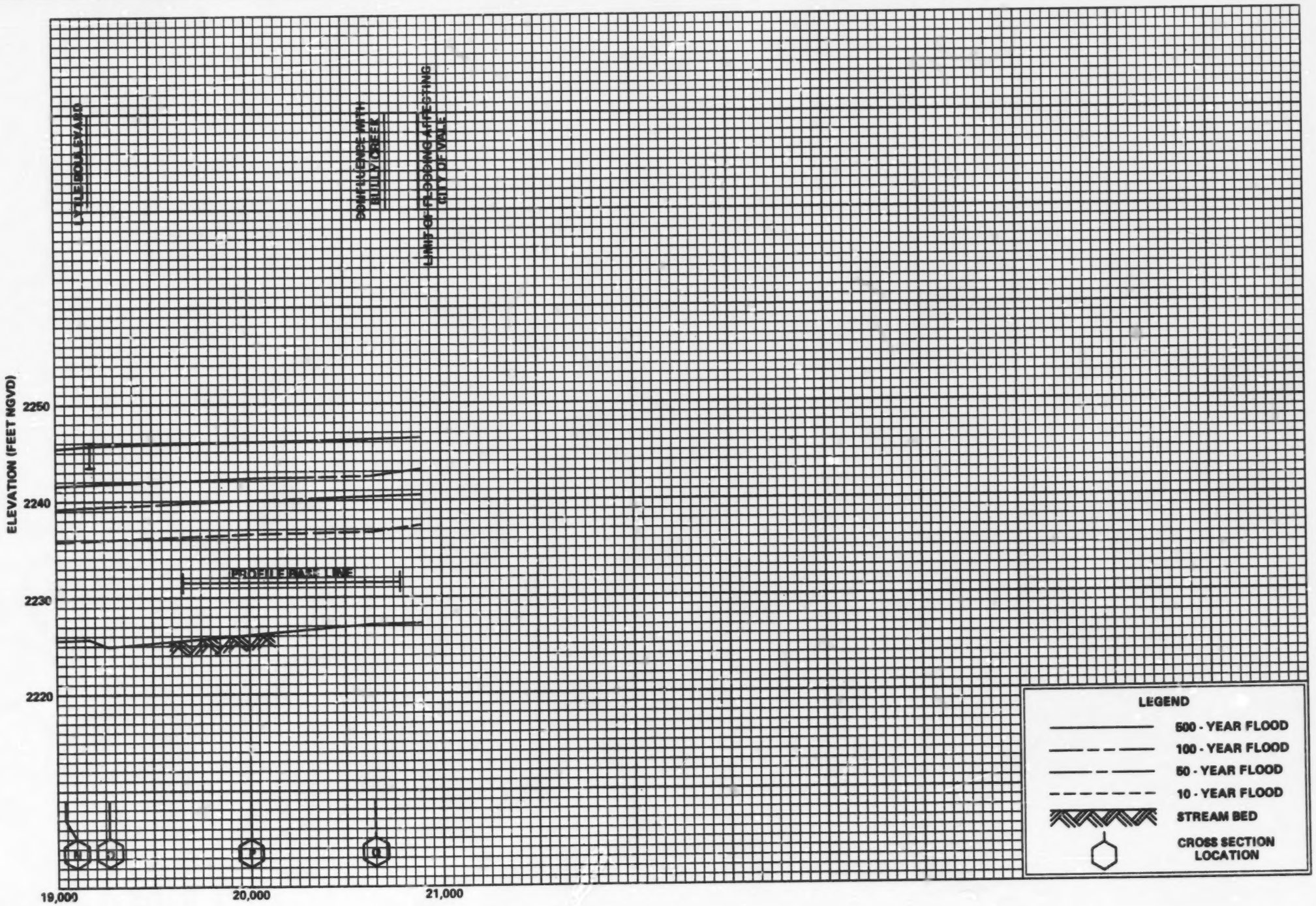

FLOOD PROFILES

MALHEUR RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

03P

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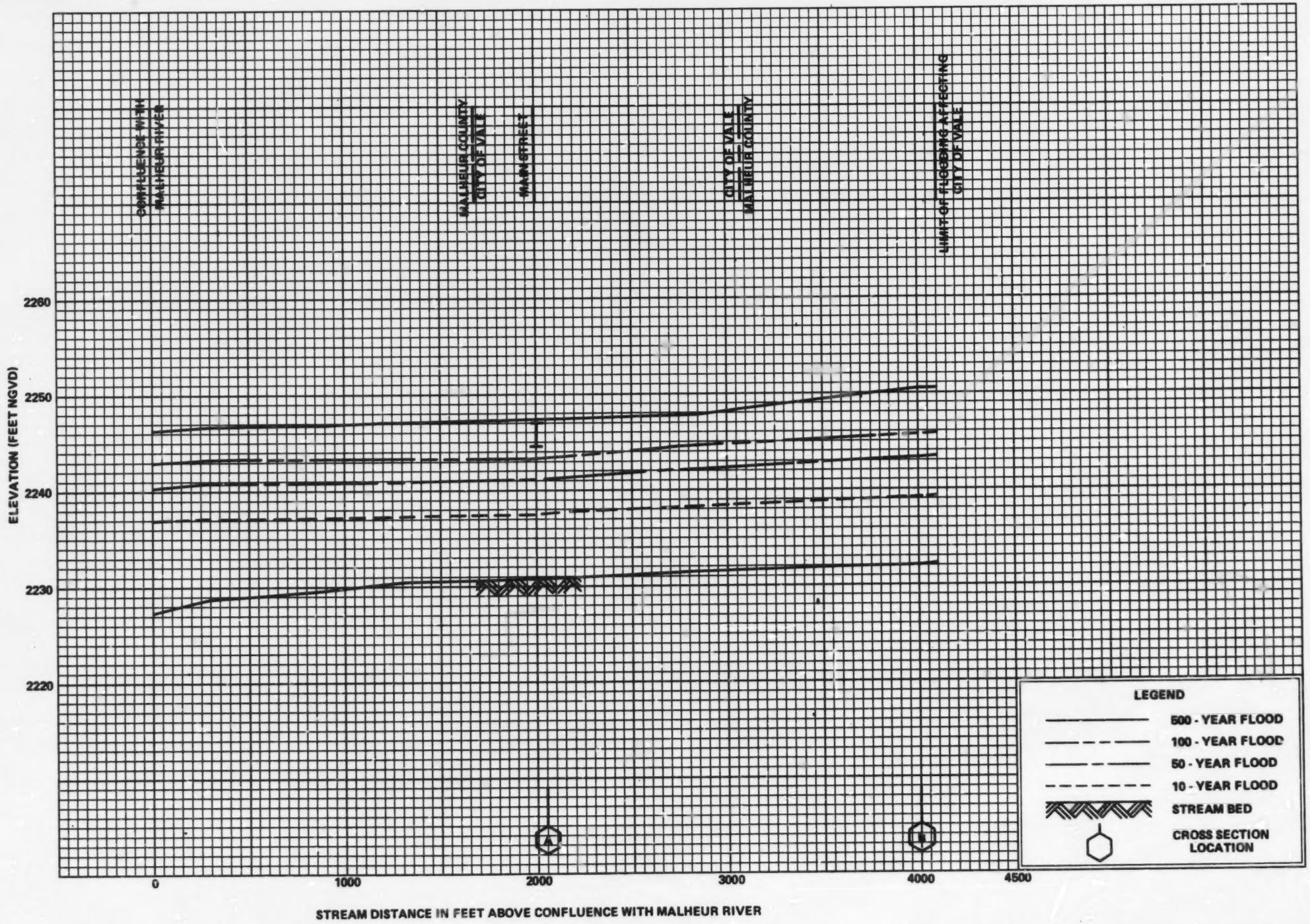

FLOOD PROFILES

BULLY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF VALE, OR
(MALHEUR CO.)

04P

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